NOTICE

All drawings located at the end of the document.

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ROCKY FLATS PLANT FINAL PHASE I RFI/RI WORK PLAN
WOMAN CREEK PRIORITY DRAINAGE OPERABLE UNIT 5

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DOCUMENT MODIFICATION REQUEST (DMR)

Refer to 1-A01-PPG-001 for Processing Instructions.
Print or Type All Information (Except Signatures)

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November 4, 1994	DMR. No. 94-DMR- ERM-0139 (line 11/10/94)

2. Existing Document Number/Revision	3. New Document Number or Document Number if it is to be changed with this Revision
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4. Originator's Name/Phone/Page/Location	5. Document Title:
Mark R. Wood/8784/5904/080-641	FINAL PHASE I RFI/RI WORK PLAN FOR OPERABLE UNIT 5 WOMAN CREEK PRIORITY DRAINAGE, Volume III - Text to Technical Memorandum No. 15 - Amended Field Sampling Plan

6. Document Type ☐ Procedure
X Other Work Plan

7. Document Modification Type (Check only one)
☐ New ☐ Revision ☐ Intent Change x Nonintent Change ☐ Editorial Correction ☐ Cancellation

8. Item	9. Page	10. Step	11. Proposed Modifications
1	3-2	3.1.1	Move second paragraph to follow after the third paragraph, Groundwater Investigation.
2	Tables line ~~3-3~~	3.1.2	Insert revised Table 3.1.2-1
3	3-6	3.1.2.2	Second paragraph, revise third sentence as follows: Therefore, based on the overall visible width of the existing failures and the accessibility, nineteen boreholes will be located in IHSS 115 as shown in Figure 3.1.2.2-1. Soil samples will be collected in accordance with SOP GT.2, Drilling and Sampling Using Hollow-Stem Auger Techniques until weathered bedrock is encountered; at which time the sampler will be switched from a drive sampler over to a Shelby tube-type sampler. The borings will be advanced 2-ft into unweathered bedrock; at which time, the site geologist will determine whether to case the hole in accordance with SOP GT.3, Isolating Bedrock from Alluvium with Grouted Surface Casing, or abandon the hole in accordance with SOP GT.5, Plugging and Abandonment of Boreholes.
4	Figures line ~~3-6~~	3.1.2.2	Insert revised Figure 3.1.2.2-1.
5	3-6	3.1.2.2	Third paragraph, replace as follows: Five of the nineteen geotechnical boreholes, to be located in the principal landslide failure areas, may require surface casing in order to advance the boring for the following three reasons: one, to confirm the presence of unweathered bedrock; two, to prevent the potential for cross contamination between the Upper Hydrostratigraphic Unit (UHSU) and the Lower Hydrostratigraphic Unit (LHSU); and three, to confirm that there are no more landslide rupture planes at depth. Six-inch nominal diameter, schedule 80, polyvinyl chloride (PVC) casing will be installed as the surface casing. Information obtained from the boreholes will provide input for both the stability analysis and the groundwater modeling. Depth-to-bedrock data will be used to revise the bedrock topography in OU5.
6	3-7	3.1.2.2	First paragraph, revise as follows: Core samples will be retained in core boxes and logged in accordance with SOP GT.1, Logging and (new 11/4/94) Alluvial and Bedrock Material. Core samples will not be submitted for environmental chemical analysis. However, if field screening indicates the potential for contaminants, environmental samples will be collected for analysis for OU5 target analytes (Table 3.1.2-1). Soil cuttings generated from within IHSS 115 will be composite sampled, one per four drums, and managed in accordance with the following SOPs: FO.8, Handling of Drilling Fluids and Cuttings; FO.10, Receiving, Labeling, and Handling Environmental Material Containers; FO.23, Management of Soil and Sediment Investigative Derived Materials (IDM); and FO.29, Disposition of Soil and Sediment Investigation Derived Materials. Boreholes located outside of IHSS 115 and adjacent to borings or wells drilled in 1993 that indicate no contamination will have the soil cuttings handled in accordance with SOP FO.23, Management of Soil and Sediment Investigative Derived Materials (IDM), for removal to the landfill.

12. Justification (Reason for Modification, EJO#, TP#, etc.)

Address locations and siting rationale for three deep bedrock monitoring wells in OU5 as proposed in Technical Memorandum No. 15. On the basis of the OU5 Feasibility Study team's review of Technical Memorandum No. 15, Geotechnical Evaluation, additional geotechnical work at IHSS 115 is required. In addition, bulk soil samples will be collected from IHSS 133 for solidification treatability studies. The DOE-RFFO counterpart, Kurt Muenchow, verbally concurs with the scope of this Document Modification Request.

If modification is for a new procedure or a revision, list concurring disciplines in Block 13, and enter N/A in Blocks 14 and 15. If modification is for any type of change or a cancellation, organizations are listed in Block 13, then Concurror prints, and signs in Block 14, and dates in Block 15.

13. Organization	14. Print and Sign (if applicable)	15. Date (if applicable)
EQS	[signature]	11.8.94
OU5 FS Team	R.M. Cygnarowicz R.M. Cygnarowicz	11-4-94
OU5 PM	C.A. Bicher C.A. Bicher	11-4-94
EQM	Robert G. Smith Robert G. Smith	11-4-94

16. Originator's Supervisor (print/sign/date) Ed Masi/ C.A. Bicher for EC Masi

17. Assigned SME/Phone/Page/Location	18. Cost Center	19. Charge Number	20. Requested Completion Date	21. Effective Date
Mark R. Wood/8784/5904/080-641 M.R. Wood	3120	98647900	November 7, 1994	11/10/94 line

22. Accelerated Review? Yes ☐ No x

23. ORC Review: Not Required

24. Responsible Manager (print, sign, date)
Ed Masi/ C.A. Bicher for EC Masi 11-4-94

REVIEWED FOR CLASSIFICATION/UCNI
BY NA
DATE NA

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2. or 3. Document Number/Revision: 21100-WP-OU 05.1/Rev 3 lmc	3. Document Title: FINAL PHASE I RFI/RI WORK PLAN FOR OPERABLE UNIT 5 WOMAN CREEK PRIORITY DRAINAGE, Volume III - Text to Technical Memorandum No. 15 - Amended Field Sampling Plan

8. Item	9. Page	10. Step	11. Proposed Modifications
7	3-7	3.1.2.2	Third paragraph, replace the first sentence with the following two sentences: As part of the groundwater investigation, nine geotechnical borehole locations (Figure 3.1.2.2-1) will have two-inch nominal diameter PVC piezometers installed. If sufficient groundwater is present, the piezometers will be sampled on a quarterly basis for one year for OU5 target analytes (Table 3.1.2-1).
8	3-8	3.1.2.2	First paragraph, after first sentence, modify the paragraph as follows: Soil samples will be collected from each sampling run in the geotechnical boreholes. Geotechnical testing minimum requirements are outlined in Table 3.1.2-1. Soil samples for geotechnical testing will be selected in the field on the basis of the site engineering geologist and the Feasibility Study Team representative's decision. Sample locations will typically be collected from each soil material encountered (minimum one of each material type - waste, alluvium and colluvium, shear zone, weathered bedrock, and unweathered bedrock). Geotechnical testing will consist of moisture content, natural density (dry and moist), Atterberg Limits, grain-size distribution (including hydrometer analyses), unconfined compression (UNC), isotropically consolidated undrained triaxial (ICU), drained direct shear (DDS), consolidation, and compaction. If a sample with a length to diameter ratio of 2:1 can be obtained an undrained unconsolidated triaxial compression test (UU) may be run. Soil samples that are not selected for analysis will be retained in the core boxes.
9	3-8	3.1.2.2	Delete second and third paragraphs.
10	3-9	3.1.2.2	*Delete second and third paragraphs.*
11	3-10	3.1.2.3	First paragraph, first work element, revise as follows: install and develop 9 piezometers, 5 mini-wells, and three deep bedrock (LHSU) monitoring wells (Figure 3.1.2.2-1). After the three work elements, delete the first sentence and replace with the following two sentences: The purpose of installing the nine piezometers and five mini-wells is to further characterize the presence or absence of ground water. The nine piezometers to be installed will be constructed in the geotechnical boreholes (see Section 3.1.2.2) where groundwater is encountered.
12	3-11	3.1.2.3	Above first paragraph, add the following paragraphs: Three bedrock monitoring wells will be installed to evaluate the potential for hydraulic interaction between the groundwater from the Upper Hydrostratigraphic Unit (UHSU), consisting of alluvial and weathered bedrock materials, and the Lower Hydrostratigraphic Unit (LHSU), unweathered bedrock materials. The bedrock monitoring wells will be installed in an attempt to identify possible sandstone units, fracture zones, or other potential water bearing intervals in the LHSU. Figure 3.1.2.2-1 shows the location of the three bedrock monitoring well locations around IHSS 115 (the old landfill). There will be three wells installed, one upgradient and two downgradient. In addition, the bedrock wells are located near UHSU wells or mini-wells for evaluation of vertical hydraulic gradients. Borings will be drilled in accordance with SOPs GT.2, Drilling and Sampling Using Hollow-Stem Auger Drilling Techniques and GT.4, Rotary Drilling and Rock Coring. A 6 inch nominal diameter, schedule 80 PVC, surface casing will be grouted a minimum of 3 feet into unweathered bedrock in accordance with SOP GT.3, Isolating Bedrock from Alluvium with Grouted Surface Casing. Based on existing boring log information this depth will be approximately 20 to 40 feet below ground surface. The borings will be advanced to an approximate depth of 150 feet or 15 feet past a potential water bearing interval, if the water bearing interval is encountered at a depth less than 150 feet. The borings will be geophysically logged, in accordance with SOP GT.15 Geophysical Borehole Logging, using the following open hole logging techniques: neutron, natural gamma, gamma-gamma, density, induction, caliper, guard resistivity, and single point resistivity (the last two methods only if groundwater is encountered in the bedrock). A down hole video log of the open hole will be made provided the hole remains stable. On the basis of the recovered core and the geophysical logs a screen interval will be selected and the monitoring well constructed in accordance with SOP GT.6, Monitoring Wells and Piezometer Installation. Well construction will consist of 2-inch nominal diameter, PVC, casing with 0.01-inch slotted screen. Screen length will be determined in the field. Field activities will be conducted in accordance with the appropriate Environmental Restoration SOPs. Core samples will be retained in core boxes and logged in accordance with SOP GT.1, Logging Alluvial and Bedrock Material. Composite soil samples of alluvial materials will be collected in accordance with the procedures specified in TM7 for boreholes at IHSS 133 (EG&G, 1993e). In addition, discrete samples will be collected at 2-foot intervals for VOC analyses. Soil cuttings generated from weathered bedrock will be composite sampled for OU5 target analytes, one per four drums, and managed in accordance with the following SOPs: FO.8, Handling of Drilling Fluids and Cuttings; FO.10, Receiving, Labeling, and Handling Environmental Material Containers; FO.23, Management of Soil and Sediment Investigative Derived Materials (IDM); and FO.29, Disposition of Soil and Sediment Investigation Derived Materials. Core samples from the unweathered bedrock will not be collected for environmental chemical analyses, however, if field screening indicates the potential for contaminants, environmental samples will be collected for analysis for OU5 target analytes (Table 3.1.2-1). The boreholes for the bedrock monitoring wells are located outside of IHSS 115 and adjacent to wells drilled in 1993 that indicate no contamination, therefore, the soil cuttings generated from the unweathered bedrock will be handled in accordance with SOP FO.23, Management of Soil and Sediment Investigative Derived Materials (IDM), for removal to the landfill. The three deep bedrock monitoring wells will be developed in accordance with SOP GW.2, Well Development. The bedrock wells will be sampled for OU5 target analytes (Table 3.1.2-1) on a quarterly basis for one year in accordance with GW.6, Groundwater Sampling. If sufficient groundwater is encountered, the deep bedrock monitoring wells may have aquifer tests performed, either slug (GW.4) or pumping (GW.8) tests. Water levels will be collected monthly for one year after development.
13	3-22	3.2.2.1	After second paragraph, add the following paragraph: In addition the TDEM anomalies or existing known trenches observed with representative ash pit material will have bulk soil samples collected for solidification treatability studies. The bulk sample will be collected using the large diameter Kansas sampler and placed into DOT 3-gallon or 5-gallon containers. Bulk soil samples will be analyzed for the above referenced target analytes.

12. Justification (Reason for Modification, EJO#, TP#, etc.)

There are numerous existing boreholes in and near IHSS 115 that will be used to obtain some of these data. However, there use will be limited because they were installed for the collection of environmental data not specifically for the collection of geotechnical data.

Groundwater Investigation. Given that many proposed monitoring well locations drilled during OU5 Phase I RFI/RI activities were not installed because the boreholes did not indicate or produce groundwater, the presence of groundwater and potential groundwater migration pathways downgradient of the Original Landfill need to be further characterized. This information is required for both the nature and extent evaluation and the groundwater modelling. Additionally, groundwater levels need to be monitored at IHSS 115 in order to provide the necessary input for the hydrogeologic model.

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In addition, the bedrock beneath or near the Original Landfill, and possible hydraulic connection between the alluvial material and bedrock needs to be characterized due to the indicated presence of sandstone in the vicinity of the Original Landfill (EG&G, 1992e).

Storm Sewer Investigation. Only one sample was collected at the storm sewer outfall. This is not a sufficient amount of samples collected to understand what, if any, contamination is carried by the storm sewer. Additional samples will need to be collected during various flow periods to better understand the nature and extent of contamination.

Air Monitoring. TM12, which evaluated the potential exposure scenarios associated with OU5, concluded that re-suspension of contaminated surface soils from IHSS 115 by wind is an insignificant potential exposure pathway (EG&G, 1993i). Insignificant potential exposure pathways will be quantitatively evaluated.

The second task consists of reviewing topographic maps prior to the slump. If a topographic map of an appropriate scale and contour interval (2-foot) cannot be located, large scale stereo pair aerial photographs may be used to estimate pre-slump topography.

For the third task, the subsurface geometry shall be obtained from boreholes. Locations of existing boreholes do not provide adequate areal distribution to characterize the subsurface geometry. Therefore, based on the overall visible width of the existing failures and the accessibility, nineteen boreholes will be located in IHSS 115 as shown in Figure 3.1.2.2-1. Soil samples will be collected in accordance with SOP GT.2, Drilling and Sampling Using Hollow-Stem Auger Techniques until weathered bedrock is encountered: at which time the sampler will be switched from a drive sampler over to a Shelby tube-type sampler. The borings will be advanced 2-ft. into unweathered bedrock; at which time, the site geologist will determine whether to case the hole in accordance with SOP GT.3, Isolating Bedrock from Alluvium with Grouted Surface Casing, or abandon the hole in accordance with SOP GT.5, Plugging and Abandonment of Boreholes. Boreholes and soil samples will be logged in accordance with SOP GT.1, Logging Alluvial and Bedrock Material. All locations will be surveyed in accordance with SOP GT.17, Land Surveying (0.1 foot accuracy).

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Five of the nineteen geotechnical boreholes, to be located in the principal landslide failure areas, may require surface casing in order to advance the boring for the following three reasons: one, to confirm the presence of unweathered bedrock; two, to prevent the potential for cross contamination between the Upper Hydrostratigraphic Unit (UHSU) and the Lower Hydrostratigraphic Unit (LHSU); and three, to confirm that there are no more landslide rupture planes at depth. Six-inch nominal diameter, schedule 80, polyvinylchloride (PVC) casing will be installed as the surface casing. Information obtained from the boreholes will provide input

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for both the stability analysis and the groundwatering modeling. Depth-to-bedrock data will be used to revise the bedrock topography in OU5.

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Core samples will be retained in core boxes and logged in accordance with SOP GT.1. Logging Alluvial and Bedrock Material. Core samples will not be submitted for environmental chemical analysis. However, if field screening indicates the potential for contaminants, environmental samples will collected for analysis for OU5 target analytes (Table 3.1.2-1). Soil cuttings generated from within IHSS 115 will be composite sampled, one per four drums, and managed in accordance with the following SOPs: FO.8, Handling of Drilling Fluids and Cuttings; FO.10, Receiving, Labeling, and Handling Environmental Material Containers; FO.23, *Management of* Soil and Sediment Investigative Derived Materials (IDM); and FO.29, Disposition of Soil and Sediment Investigation Derived Materials. Boreholes located outside of IHSS 115 and adjacent to borings or wells drilled in 1993 that indicate no contamination will have the soil cuttings handled in accordance with SOP FO.23, Management of Soil and Sediment Investigative Derived Materials (IDM), for removal to the landfill.

Field quality control (QC) samples will be collected for both soil and groundwater samples. Duplicate samples will be collected with the frequency of one duplicate sample per 10 real samples. Rinsate samples will be collected with the frequency of one rinsate sample per 20 real samples or a minimum of one rinsate sample per day of sampling.

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As part of the groundwater investigation, nine geotechnical borehole locations (Figure 3.1.2.2-1) will have two-inch nominal diameter PVC piezometers installed. If sufficient groundwater is present, the piezometers will be sampled on a quarterly basis for one year for OU5 target analytes (Table 3.1.2-1). These piezometers will provide water level data for the hydrogeologic model. The piezometers will be installed in accordance with SOP GT.6, Monitoring Wells and

Piezometer Installation, and developed in accordance with SOP GW.2, Well Development. They will be surveyed in accordance with SOP GT.17 Land Surveying (top of inner casing and protective casing measured to 0.01 foot accuracy vertically).

Soil samples will be collected from each sampling run in the geotechnical boreholes. Geotechnical testing minimum requirements are outlined in Table 3.1.2-1. Soil samples for geotechnical testing will be selected in the field on the basis of the site engineering geologist and the Feasibility Study Team representative's decision. Sample locations will typically be collected from each soil material encountered (minimum one of each material type - waste, alluvium and colluvium, shear zone, weathered bedrock, and unweathered bedrock). Geotechnical testing will consist of moisture content, natural density (dry and moist), Atterberg Limits, grain-size distribution (including hydrometer analyses), unconfined compression (UNC), isotropically consolidated undrained triaxial (ICU), drained direct shear (DDS), consolidation, and compaction. If a sample with a length to diameter ratio of 2:1 can be obtained, an undrained unconsolidated triaxial compression test (UU) may be run. Soil samples that are not selected for analysis will be retained in the core boxes.

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The fifth task consists of both back calculating strength parameters of the subsurface materials and calculating the long-term stability at the original landfill in its current configuration. The stability will be analyzed using a method of slice analysis.

3.1.2.3 Groundwater Investigation

In order to more completely evaluate the presence and quality of groundwater at and downgradient of the Original Landfill, additional groundwater samples need to be collected and analyzed. Since the presence and quantity of groundwater appears to be limited, this task shall consist of three work elements:

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1) install and develop 9 piezometers, 5 mini-wells, and three deep bedrock (LHSU) monitoring wells (Figure 3.1.2.2-1);

2) measure water levels in all well points, mini-wells, piezometers, and monitoring wells that are along or north of Woman Creek, south of the south Buffer-Zone access road, east of the western edge of IHSS 115 (approximately CPT07393), and west of the eastern edge of IHSS 115 (approximately CPT05393) on a monthly basis for one year; and

3) obtain samples from any location that is downgradient of the landfill if water level measurements indicate presence of a sufficient quantity of water.

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The purpose of installing the nine piezometers and five mini-wells is to further characterize the present or absence of groundwater. The nine piezometers to be installed will be constructed in the geotechnical boreholes (see Secion 3.1.2.2) where groundwater is encountered. The five proposed mini-well locations are placed in 1) bedrock lows that were identified during the CPT investigation (but water was not detected), and 2) between existing well points. Of the five mini-wells to be installed, four shall be installed downgradient of IHSS 115 and one shall be installed on the upper level part of the eastern end of IHSS 115 in the vicinity of borehole 50792. This latter location will be used for only water level input for the hydrogeologic model and not sampling. These mini-wells will be installed using a small all-terrain vehicle rig which does not produce soil cuttings. Composite soil samples will be collected during drilling in accordance with the procedures outlined in TM7 (EG&G, 1993e). In addition, discrete samples

will be collected at 2-foot intervals for VOC analyses. Analytical parameters for soil samples will be the same as specified in the OU5 Work Plan (see Table 3.1.2-1).

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Three bedrock monitoring wells will be installed to evaluate the potential for hydraulic interaction between the groundwater from the Upper Hydrostratigraphic Unit (UHSU), consisting of alluvial and weathered bedrock materials, and the Lower Hydrostratigraphic Unit (LHSU), unweathered bedrock materials. The bedrock monitoring wells will be installed in an attempt to identify possible sandstone units, fracture zones, or other potential water bearing intervals in the LHSU. Figure 3.1.2.2-1 shows the location of the three bedrock monitoring well locations around IHSS 115 (the old landfill). There will be three wells installed, one upgradient and two downgradient. In addition, the bedrock wells are located near UHSU wells or mini-wells for evaluation of vertical hydraulic gradients.

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Borings will be drilled in accordance with SOPS GT.2, Drilling and Sampling Using Hollow-Auger Drilling Techniques and GT.4, Rotary Drilling and Rock Coring. A 6-inch nominal diameter, schedule 80 PVC, surface casing will be grouted a minimum of 3 feet into unweathered bedrock in accordance with SOP GT.3, Isolating Bedrock from Alluvium with Grouted Surface Casing. Based on existing boring log information, this depth will be approximately 20 to 40 feet below ground surface. The borings will be advanced to an approximate depth of 150 feet of 15 feet past a potential water bearing interval, if the water bearing interval is encountered at a depth less than 150 feet. The borings will be geophysically logged, in accordance with SOP GT.15 Geophysical Borehole Logging using the following open hole logging techniques: neutron, natural gamma, gamma-gamma, density, induction, caliper, guard resistivity, and single point resistivity (the last two methods only if groundwater is encountered in the bedrock). A down hole video log of the open hole will be made provided the hole remains stable. On the basis of the recovered core and the geophysical logs, a screen

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interval will be selected and the monitoring well constructed in accordance with SOP GT.6, *Monitoring Wells and Piezometer Installation*. Well construction will consist of 2-inch nominal diameter, PVC, casing with 0.01-inch slotted screen. Screen length will be determined in the field.

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Field activities will be conducted in accordance with the appropriate Environmental Restoration SOPs. Core samples will be retained in core boxes and logged in accordance with SOP GT.1, Logging in Alluvial and Bedrock Material. Composite soil samples of alluvial materials will be collected in accordance with the procedures specified in TM7 for boreholes at IHSS 133 (EG&G, 1993e). In addition, discrete samples will be collected at 2-foot intervals for VOC analyses. Soil cuttings generated from weathered bedrock will be composite sampled for OU5 target analytes, one per four drums, and managed in accordance with the following SOPs: FO.8, Handling of Drilling Fluids and Cuttings; FO.10, Receiving, Labeling, and Handling Environmental Material Containers; FO.23, Management of Soil and Sediment Investigative Derived Materials (IDM); and F).29, Disposition of Soil and Sediment Investigation Derived Materials. Core samples from the unweathered bedrock will not be collected for environmental chemical analyses, however, if field screening indicates the potential for contaminants, environmental samples will be collected for analysis for OU5 target analytes (Table 3.1.2-1). The boreholes for the bedrock monitoring wells are located outside of IHSS 115 and adjacent to wells drilled in 1993 that indicate no contamination, therefore, the soil cuttings generated from the unweathered bedrock will be handled in accordance with SOP FO.23, Management of Soil and Sediment Investigative Derived Materials (IDM), for removel to the landfill.

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The three deep bedrock monitoring wells will be developed in accordance with SOP GW.2, Well Development. The bedrock wells will be sampled on a quarterly basis for OU5 target analytes (Table 3.1.2-1) for one year in accordance with GW.6, Groundwater Sampling. If sufficient

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groundwater is encountered, the deep bedrock monitoring wells may have aquifer tests performed, either slug (GW.4) or pumping (GW.8) tests. Water levels will be collected monthly for one year after development.

Water levels will be measured in all the monitoring wells, well points, and piezometers located along or north of Woman Creek, south of West Road, east of the western Buffer-Zone boundary road, and west of First Street. This includes the piezometers along Woman Creek as discussed in a subsequent paragraph. Water level measurements will continue monthly for a year. This will characterize the magnitude of seasonal fluctuations and provide the hydrogeologic model an average level.

Groundwater samples shall be obtained from any well point or mini-well that is downgradient of the landfill (existing or new) if water level measurements indicate presence of a sufficient quantity of water. These samples will be collected quarterly for at least one year or when sufficient water is present, however, no more than four samples will be collected in one year. Groundwater samples will be collected in the priority listed on Table 3.1.2.3-1. Information from these work elements will be used for the evaluation of nature and extent, as well as input for the hydrogeologic model.

Field QC samples will be collected for both soil and groundwater samples. Duplicate samples will be collected with the frequency of one duplicate sample per 10 real samples. Rinsate samples will be collected with the frequency of one rinsate sample per 20 real samples or a minimum of one rinsate sample per day of sampling. Because groundwater sampling equipment is dedicated, the instrument probes used to measure field parameters will be rinsed to obtain the groundwater rinsate samples.

Soil boreholes will be drilled to geologically and chemically characterize the surface and subsurface materials within the four anomalous areas identified from the TDEM survey that seem to be associated with possible trenches (see discussion in Section 2.5.2.2.3 of Volume 2). These soil boreholes will also assist in assessing the lateral and vertical extent of the trenches and pits. Seven boreholes (Figure 3.2.2.1-1) will be drilled in these four anomalous areas. Specifically,

- one borehole will be located approximately 10 ft southeast of the concrete pad, in the north-central portion of IHSS 133,
- two soil boreholes will be advanced at a location approximately 25 ft north of IHSS 133.6 and 25 ft south of the dirt road underneath the power lines,
- one borehole will be drilled at IHSS 133.4, in the center of the TDEM anomaly associated with the northern trench, approximately midway between existing boreholes 55993 and 56093C, and
- three boreholes will be advanced on either end and the center of the geophysical anomaly between IHSS 133.3 and IHSS 133.4, approximately 20 ft south of the dirt road beneath the power lines.

All drilling and sampling activities will be conducted in accordance with the procedures outlined in TM7 and as defined by EG&G's SOPs. These soil samples will be analyzed for TAL metals, uranium-233/234, uranium-235, uranium-238, plutonium-239/240, americium-241, gross alpha, and gross beta. Ten percent of the soil samples collected will also be analyzed for grain-size distribution (+200 fraction).

In addition, the TDEM anomalies or existing known trenches observed with representative ash pit material will have bulk soil samples collected for solidification treatability studies. The bulk sample will be collected using the large diameter Kanses sampler and placed into DOT 3-gallon

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or 5-gallon containers. Bulk soil samples will be analyzed for the above referenced target analytes.

Due to the overhead powerlines, it is anticipated that all of the drilling will be accomplished with small rigs using the Kansas sampler. This type of borehole also offers the advantage over HSA boreholes in that there are no cuttings and only small quantities of residual soil from sampling that need to be handled (disposed).

Table 3.1.2-1. Summary of Amended Field Sampling Plan
IHSS 115 (Original Landfill) and IHSS 196 (Filter Backwash Pond)
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EVALUATION	ACTIVITY	NO. OF SAMPLING LOCATIONS	SAMPLING FREQUENCY	ANALYTICAL PARAMETERS	FIELD QUALITY CONTROL SAMPLES/PROGRAM	APPLICABLE SECTION OF TEXT
Intrinsic Air Permeability Test Evaluation	Review soil gas survey vacuum pressures, borehole logs, and analytical results	NA	NA	NA	NA	3.1.2.1
	Resample at low vacuum pressures	TBD	TBD	1,1,1-TCA benzene carbon tetrachloride DCM TCE PCE	1 duplicate/10 samples 1 syringe blank/each syringe use instrument calibration at beginning and end of each day and every 8 hours	
Geotechnical Evaluation	Review information regarding existing slump	NA	NA	NA	NA	3.1.2.2
	Evaluate pre- and post-slump surface geometry	NA	NA	NA	NA	
	Evaluate subsurface geometry/geotechnical properties	19 hollow-stem auger (HSA) boreholes (nine with piezometers installed, page 3 of 4)	continuous core	field screening core logging	NA	
			discrete soil sample every third sampler (approx. 6 feet)	natural moisture content	NA	
			1 sample from last 2 feet of alluvium above bedrock	natural moisture content, natural density (dry and moist), grain-size distribution, and Atterberg limits	NA	

Table 3.1.2-1. Summary of Amended Field Sampling Plan
IHSS 115 (Original Landfill) and IHSS 196 (Filter Backwash Pond)

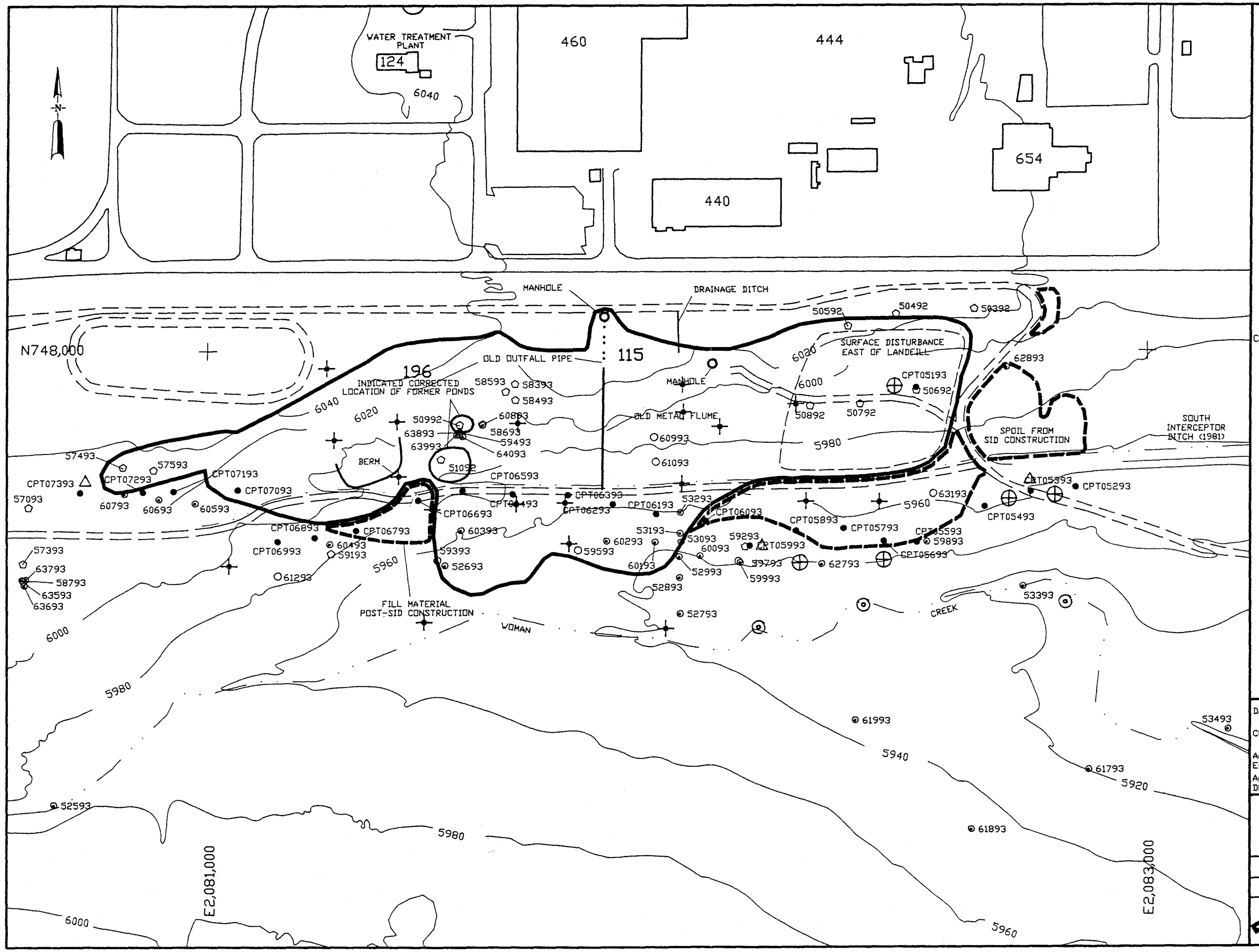
EVALUATION	ACTIVITY	NO. OF SAMPLING LOCATIONS	SAMPLING FREQUENCY	ANALYTICAL PARAMETERS	FIELD QUALITY CONTROL SAMPLES/PROGRAM	APPLICABLE SECTION OF TEXT
Geotechnical Evaluation (cont.)	Evaluate Subsurface geometry/geotechnical properties (cont.)		1 soil sample of each material type (waste, alluvium, and bedrock) from each borehole	6 selected samples (2 of each material type) for natural density (moist and dry), nat. moisture content, grain-size dist., Atterberg limits, and UU test	NA	3.1.2.2
			Soil samples of waste material	Selected samples	5 - Unconfined Compression (UNC) (ASTM D22166-91) 2 - Consolidation (ASTM D2435-90) 25 - Density (ASTM D2216-92) 2 - Compaction (ASTM D1557-91) 5 - Atterberg Limits (ASTM D4318-93) 20 - Gradation (ASTM D1140-92)	
			Soil samples of alluvium/colluvium	Selected samples	8 - Isotropically Consolidated Undrained Triaxial (ICU) (ASTM D4767-88) 2 - Consolidation (ASTM D2435-90) 25 - Density (ASTM D2216-92) 3 - Compaction (ASTM D1557-91) 15 - Atterberg Limits (ASTM D4318-93) 20 - Gradation (ASTM D1140-92)	

Table 3.1.2-1. Summary of Amended Field Sampling Plan
IHSS 115 (Original Landfill) and IHSS 196 (Filter Backwash Pond)

EVALUATION	ACTIVITY	NO. OF SAMPLING LOCATIONS	SAMPLING FREQUENCY	ANALYTICAL PARAMETERS	FIELD QUALITY CONTROL SAMPLES/PROGRAM	APPLICABLE SECTION OF TEXT
Geotechnical Evaluation (cont.)	Evaluate Subsurface geometry/geotechnical properties (cont.)		Soil samples of shear zone/weathered bedrock	Selected samples	8 - ICU (ASTM D4767-88) 2 - Consolidation (ASTM D2435-90) 10- Atterberg Limits (ASTM D4318-93) 5- Gradation (ASTM D1140-92)	3.1.2.2
			Soil samples of unweathered bedrock	Selected samples	3- Drained Direct Shear (ASTM D3080-90)	
		9 piezometers (HSA borehole advanced as discussed on preceding page)	monthly quarterly for one year	water level TCL VOCs, SVOCs, Pest. & PCBs, TAL Metals, and Radionuclides	replicate measurements as specified in SOP GW.01 1 dup/10 samples, 1 rinsate/20 samplesor minimum of 1 rinsate/day and associated trip blank	
	Waste and core characterization	19 HSA boreholes	1 drum composite per 4 drums (approx. 1 drum per 10 ft. of borehole)	TCL VOCs, SVOCs, Pest. & PCBs, TAL Metals, and Radionuclides	1 dup/10 samples, 1 rinsate/20 samplesor minimum of 1 rinsate/day and associated trip blank	
	Back calculate strength parameters and calculate long-term stability by method of slices.	NA	NA	NA	NA	
Groundwater Investigation	Install and sample mini-wells	5	2-foot discrete soil samples	TCL VOCs	1 dup/10 samples, 1 rinsate/20 samples or minimum of 1 rinsate/day and 1 trip blank per field crew per day per cooler	3.1.2.3
			6-foot composite soil samples or alternative composites as specified in TM7	SVOCs, Pesticides & PCBs, TAL Metals, and Radionuclides		

Table 3.1.2-1. Summary of Amended Field Sampling Plan
IHSS 115 (Original Landfill) and IHSS 196 (Filter Backwash Pond)

EVALUATION	ACTIVITY	NO. OF SAMPLING LOCATIONS	SAMPLING FREQUENCY	ANALYTICAL PARAMETERS	FIELD QUALITY CONTROL SAMPLES/PROGRAM	APPLICABLE SECTION OF TEXT
Groundwater Investigation	Install and sample mini-wells (cont.)		Groundwater - quarterly	TCL VOCs, SVOCs, Pesticides & PCBs, TAL Metals, and Radionuclides	1 dup/10 samples, 1 rinsate/20 samples or minimum of 1 rinsate/day and 1 trip blank per field crew per day per cooler	3.1.2.3
	Measure water levels	46	monthly	water level	replicate measurements as specified in SOP GW.01	
	Sample existing well points	TBD	quarterly	TCL VOCs, SVOCs, Pesticides & PCBs, TAL Metals, and Radionuclides	1 dup/10 samples, 1 rinsate/20 samples or minimum of 1 rinsate/day and 1 trip blank per crew per day per cooler	
	Characterize bedrock surface and install piezometers	3	continuous core Groundwater - quarterly	TCL VOCs, SVOCs, Pesticides & PCBs, TAL Metals, and Radionuclides	1 dup/10 samples, 1 rinsate/20 samples or minimum of 1 rinsate/day and 1 trip blank per crew per day per cooler	
	Aquifer tests	1	once	NA	NA	
Storm Sewer Sampling	Collect samples from storm sewer outfall	1	quarterly	TCL VOCs, TAL Metals, Radionuclides, and Water Quality Parameters	1 dup/10 samples, 1 rinsate/20 samples or minimum of 1 rinsate/day and associated trip blank, one per crew per day	3.1.2.4
Air Monitoring	RAAMP Monitoring	Monitoring will be conducted as specified in RAAMP documentation.				3.1.2.5
	OU5 Ambient Air Samplers	3	bi-weekly samples composited monthly	Radionuclides	As specified in SOP AP.13	
	Wind Resuspension - Evaluate Applicability of OU3 Wind Tunnel Study	TBD	TBD	TBD	TBD	
	OU5 Wind Tunnel Study	TBD	TBD	TBD	TBD	
	Evaluation of Gas Volatilization	TBD	TBD	TBD	TBD	



MAP LEGEND

- STREAMS DITCHES DRAINAGE FEATURES
- PAVED ROADS
- DIRT ROADS
- ORIGINAL LANDFILL AND SURFACE DISTURBANCE, PRE - SID
- LANDFILL AND DISTURBANCE POST - SID
- 60993 MONITORING WELL LOCATION
- 50392 BOREHOLE LOCATION
- 62893 WELL POINT LOCATIONS
- CPT05293 CONE PENTROMETER TESTING (CPT) LOCATIONS

PROPOSED GEOTECHNICAL LOCATIONS

- HOLLOW STEM AUGER (HSA) BOREHOLES

PROPOSED LOCATIONS FOR GROUNDWATER INVESTIGATION

- MINI-WELLS FOR WATER LEVELS AND QUALITY
- SMALL BOREHOLES w/ PIEZOMETERS FOR WATER LEVELS
- DEEP BEDROCK BOREHOLES/WELLS

0 100 200

SCALE: 1" = 200'

Drawn	N.M.	11/3/94 Date
Checked	[illegible]	11/3/94 Date
Approved EG&G	[illegible]	11/4/94 Date
Approved DOE		Date

PROPOSED SAMPLING LOCATIONS FOR IHSS 115

TM15 - AMENDED FIELD SAMPLING PLAN

OU5 PHASE I RFI/RI IMPLEMENTATION

EG&G

FIGURE 3.1.2.2-1

3122-1.DWG